

## THE DIPTERA OF THE TERRITORY OF NEW GUINEA. XIV.\*

FAMILY TABANIDAE. PART II. PANGONIINAE, EXCEPT THE GENUS CHRYSOPS.

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 (Communicated by Dr. G. A. M. Heydon.)

(Nine Text-figures.)

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## INTRODUCTION.

For several years before his death, the late Mr. Frank H. Taylor had been planning a revision of the Tabanidae of New Guinea and adjoining territories. For this purpose he had borrowed from the British Museum (Natural History) the collections made by Miss L. E. Cheesman, and, during 1945, Mr. Arthur Smith in London made for him a number of drawings of types and other noteworthy specimens. Unfortunately Mr. Taylor died in December, 1945, before he had completed more than the first paper of the series.

Professor Harvey Sutton very generously agreed to my suggestion that I should take over and complete Mr. Taylor's study, and sent to me the whole available material. The specimens comprise Miss Cheesman's collections from Papua, Japen Island, and the Cyclops Mts., a fine collection made by the Archbold Expedition of 1938-39 in Hollandia and the Lake Habbema-Mt. Wilhelmina region, and numerous specimens belonging to the Department of Public Health and Tropical Medicine, Sydney, many of them collected by Mr. Taylor himself in the Edie Creek area of NE. New Guinea—a total of 882 specimens. Miss Cheesman's collections are the property of the British Museum (Natural History), and the Archbold collections are held on loan from the Buitenzorg Museum, Java. Dr. Alan Stone and Dr. E. A. Chapin very kindly lent me 181 Tabanidae from the collections of the United States National Museum, Washington.

Along with the illustrations of 34 species made by Mr. Smith, I have received 13 figures drawn in Australia by Mr. E. H. Zeck, and a card-index of species prepared by Mr. Taylor. There is no manuscript nor notes, and the specimens have not been sorted. One or two random identifications have been made. It is evident that Mr. Taylor had barely completed the preliminary assembly of material and information. His paper on the genus *Chrysops*, published (posthumously) in these PROCEEDINGS in 1946, summarizes the New Guinea species, but records no new material. The genus is represented in the present material only by two females of *Chrysops albicincta* Wulp, one in the Archbold collection from Bernhard Camp, 50m., viii, 1938 (J. Olthof), and the other from Hollandia, July, 1945 (B. Malkin: Washington Coll.). Nothing in this or any subsequent paper of the series, therefore, represents any view held by Mr. Taylor unless the fact is expressly stated.

I am greatly indebted to Professor Harvey Sutton for his co-operation in sending me this material and for submitting the manuscript to the Linnean Society of New South Wales. Miss Cheesman very kindly gave me information about New Guinea and lent me her personal copy of the Archbold Reports. Mr. G. H. Hardy placed at my disposal a list of species he had compiled and sent me a summary of his views on the grouping of species of *Tabanus* in the Australasian fauna.

\* Continued from these PROCEEDINGS, lxx, 1946, 328.

## SCOPE OF PAPER.

This paper deals with the Pangoniinae, other than the genus *Chrysops*, in the collections before me. These divide into two groups, the hairy-eyed species which belong to the genus *Scaptia* Walker, and the bare-eyed species which were all formerly placed in *Silvius* Meigen. None of these is congeneric with the genotype of *Silvius*, and here they are referred to the genera *Pareucompsa* Enderlein and *Lilaea* Walker.

There is enough material to give some idea of distribution, and it is interesting that all the *Scaptia* were taken in mountainous areas above 2,000 ft., while the other two genera were taken in low-lying areas to north or south of the central mountain chain or on the coast. This is in agreement with the biological accounts of Fuller (1936) and Hill (1921).

The *Scaptia* individuals are very variable, and it is evident that there are many local forms and interlocking species. This might be expected in a genus living in mountainous habitats and liable to be divided into relatively isolated populations. It is difficult to judge from the examination of small collections of dried specimens which forms are good species and which are merely local races. Probably many more are still to be found in New Guinea.

The species of lowland habitat are much more uniform, and interesting chiefly in their generic relationships.

## LOCALITIES.

Miss Cheesman gives accounts of her own collecting trips in her books, "The Two Roads of Papua" and "Land of the Red Bird", and in articles in the *Geographical Journal*. A full and most interesting illustrated account of the Archbold Expedition is given by Archbold, Rand and Brass (1942).

The following is the list of localities in the material I have seen:

*Miss Cheesman's Collections.*

	Lat. S.	Long. E.
PAPUA. Mt. Tafa .. .. .	08-38	147-07
Mafulu .. .. .	08-30	147-00
Kokoda .. .. .	08-52	147-40
Mondo .. .. .	08-34	147-07
Yule I. .. .. .	08-47	146-30
DUTCH NEW GUINEA. Japen I. .. .. .	01-40	136-20
Cyclops Mts. .. .. .	02-30	140-30
WEST NEW GUINEA. Mt. Nomo.		

*Archbold Expedition.*

Hollandia .. .. .	02-30	140-42
Araucaria Camp .. .. .	03-30	139-11
Bernhard Camp .. .. .	03-29	139-13
Habbema Lake .. .. .	04-08	138-42
Iebele Camp .. .. .	03-58	138-46
Moss Forest Camp .. .. .	04-00	138-43
Top Camp .. .. .	03-30	139-02
Rattan Camp .. .. .	03-30	139-09
Mist Camp .. .. .	03-30	139-05
Lower Mist Camp		

*Other Collectors.*

NE. NEW GUINEA. Edie Creek .. .. .	07-00	146-30
DUTCH NEW GUINEA. Lorenz R. .. .. .	05-27	138-00
Regen I. .. .. .	04-48	138-55
Digul Mts. .. .. .	05-07	140-35

Figure 1 shows the distribution of specimens in the present material.



Fig. 1.—Localities of specimens mentioned in this paper.

Small letters, *Scaptia* spp.: a, *auripilosa*; b, *bernhardi*; c, *caliginosa*; f, *floccosa*; i, *insularis*; l, *leonina*; m, *mafulensis*; n, *novaeguineensis*; t, *taylori*; u, *unilineata*.

Capital letters: D, *Pareucompsa dimidiata*; F, *P. femoralis*; M, *Lilaea de meijerei*; V, *L. vittata*.

The shaded area represents the approximate extent of land above 2,000 ft.

KEY TO GENERA OF NEW GUINEA PANGONIINAE.

Hind tibiae with spurs: ocelli usually present.

1. Flagellum\* of antenna with eight segments. Proboscis usually much longer than head. Eyes may be hairy ..... 2
- Flagellum of antenna with four or five segments. Proboscis usually short, not greatly longer than head. Eyes bare ..... 3
2. Eyes bare. Proboscis usually long or very long, held horizontally forward, face often conically produced. No ocelli ..... *Nuceria* Walk.
- Eyes hairy. Proboscis not more than twice as long as height of head, held downwards at an angle of 45°. Ocelli present ..... *Scaptia* Walk.
3. First and second antennal segments about equal in length. Wings with dark crossbands ..... *Chrysops* Meig.
- Second antennal segment shorter than first. Wings clear or with dark crossbands ..... 4
4. First antennal segment more than twice length of second. Frons very broad, with circular callus (Fig. 7) ..... *Silvius* Meig.
- First antennal segment less than twice length of second. Frons 3-4 times as long as broad, callus club-shaped, reaching nearly to ocelli ..... 5
5. Flagellum with four segments. Wings banded (Fig. 9) ..... *Pareucompsa* End.
- Flagellum with five segments. Wings not banded ..... *Lilaea* Walk.

Genus NUCERIA.

*Nuceria* Walker, 1850, *Ins. Saunds. Dipt.*, I, p. 7. Genotype: *Pangonius longirostris* Hardw., by designation of Coquillett, 1910.

*Corizoneura* Rondani, 1864, *Arch. zool. Modena*, 3, p. 85. Genotype: *Pangonia appendiculata* Macq. (*Tanyglossa aethiopica* Thunb.), by designation of Coquillett, 1910.

*Siridorhina* Enderlein, 1922, *Mitt. zool. Mus. Berl.*, 10, p. 336. Genotype: *Pangonius longirostris* Hardw., by original designation.

Nor: *Nuceria* Enderlein, 1922, p. 339 (= *Philoliche* Wied.).

*Corizoneura* Enderlein, 1922, p. 337 (= *Ectenopsis* Macq.).

A genus recognized by the prominent, conical snout and elongate proboscis, which is often 2-3 times the length of the body. It is distinguished from *Pangonius* Latr. (*sensu stricto*) of the Palaearctic Region by the absence of ocelli, and from the African *Philoliche* Wd. by the usually open first posterior cell. This latter is not an infallible

\* *Flagellum* here and throughout means the whole antenna beyond the first two segments (scape and pedicel).

guide and occasionally specimens occur with this cell closed in one or both wings. Perhaps this group of species is no more than subgenerically distinct from *Philoliche*, but it is convenient to separate them off from the large group of African species that have the first posterior cell decisively closed.

The length of the proboscis and degree of prominence of the face vary considerably between one species and another, and sometimes within one species. Bequaert (1930, p. 881) regards both these characters as purely adaptive and varying together. A number of genera have been recognized among those species with a less strikingly developed snout.

I have seen no specimens of *Nuceria* from New Guinea, though *N. amboinensis* Fabr. might be expected to occur there. Schuurmans Stekhoven (1926, p. 67) records this species also from Timor, though his specimens have not such obvious thoracic stripes as the descriptions of Fabricius and Wiedemann would indicate.

In the British Museum is a series from Bigot's collection of an undoubted *Nuceria*, which he labelled "*amboinensis* F.", and which has prominent thoracic stripes. The locality is given simply as "E. Indes", and in view of Bigot's somewhat high-handed treatment of existing locality-labels the localities of his specimens are never altogether reliable. There is always confusion between "E. Indes" and "E. India". This species seems to be closely allied to the Indian *N. rufa* Macq., and, indeed, two further specimens in the series are labelled "Bombay". Altogether I have not much confidence in this identification, but if it should be correct it would seem that *N. amboinensis* is an off-shoot of the Indo-Oriental fauna and may not reach New Guinea.

*Pangonia neocaledonica* Mégnin was regarded by Ricardo as a synonym of *leucopicta* Bigot, of which the type, from New Caledonia, is in the British Museum. We have also a series of a similar, but smaller, species, which seems to be those specimens referred to by Bigot (1878, *Ann. Soc. ent. Fr.*, (5) viii, Bull. cxlv, p. 139) in his augmented description of Mégnin's species. It seems as if two species are concerned here, but neither is a typical *Nuceria*, nor—since they lack ocelli—can they be referred to *Buplex*. In facial structure they seem most nearly to approach the African groups *Philoliche* and *Ommatiosteres*. The Washington material contains two females of *leucopicta* from Koumac, New Caledonia, 16.xi.45 (D. G. Hall). I have not seen either species from New Guinea.

#### Genus SCAPTIA.

*Scaptia* Walker, 1850, *Ins. Saunds. Dipt.*, I, p. 8. Genotype: *Pangonius auratus* Macq.

*Melpia* Walker, 1850, *Ibid.*, I, p. 8. Genotype: *Pangonius fulvithorax* Wied.

*Oscia* Walker, 1850, *Ibid.*, I, p. 10. Genotype: *Pangonius depressus* Macq. (*Tabanus latus* Guér.)

*Diatomineura* Rondani, 1864, *Arch. zool. Modena*, 3, p. 84. Genotype: *Pangonius depressus* Macq.

*Erephopsis* Rondani, 1864, *Ibid.*, 3, p. 85. Genotype: *Pangonius fulvithorax* Wied.

All the above genotypes designated by Coquillett, 1910.

The synonymy of this genus has been discussed by Ferguson (1926, pp. 294-299), who also suggested lines along which the genus might subsequently be divided.

Apart from the "Pangonie fuligineuse" of Boisduval, considered and rejected by Ferguson (1924, p. 257), three species of *Scaptia* have been recorded from New Guinea: *caliginosa* Walk., *novaeguineensis* Ric., and *albibarbis* S.S. In the British Museum, I have the type of the first and a paratype of the second, but I have not seen the third. Miss Cheesman, Archbold and Taylor all took specimens of this genus.

With the exception of *novaeguineensis*, the New Guinea species of *Scaptia* are of uniform appearance, and the differences between them are mainly small details of colour and pattern. The shape of the palpi, especially the relative extent of the bare area, is helpful in separating some species, but is subject to individual variation. I have not found any significant differences in the relative length of palpi and proboscis (cf., Ferguson, 1926).

The material I have studied can readily be divided into a number of units, but it is notable that each unit is made up of specimens from the same, or closely neighbouring, localities. It is likely, therefore, that some of these units will prove to be geographical races rather than distinct species. This is particularly true of the two species *floccosa* and *insularis*, which may be forms of *caliginosa* Walk. *S. taylori* is closely related, but since it occurs at Edie Creek with a normal specimen of *floccosa* it would seem to be a good species.

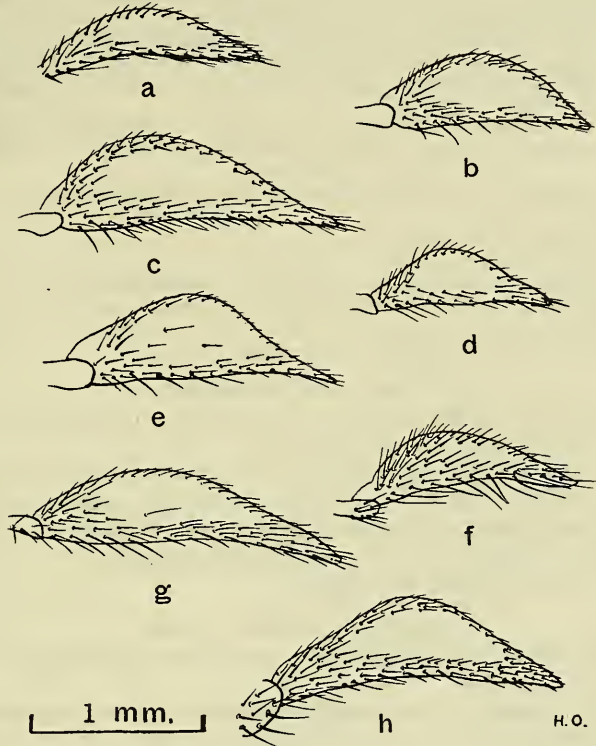


Fig. 2.—*Scaptia* spp., second segment of palp: a, *unilineata*; b, *mafulensis*; c, *insularis*; d, *leonina*; e, *caliginosa*; f, *auripilosa*; g, *floccosa*; h, *bernhardi*.

I have not recognized *albibarbis* S.S. From the description it seems to be close to my species *unilineata*, but differs in a number of details, the pubescence of the eyes, the pale hairs posteriorly on the scutum, black hypopleural bristles, and in the abdominal pattern.

In descriptions of the wing-pattern I have referred to the basal and apical bands. These are well shown in Mr. Zeck's figure of *floccosa* (Fig. 6).

KEY TO SPECIES OF SCAPTIA.

1. Thorax and abdomen with uniform covering of golden hairs ..... 2  
 Abdomen without golden hairs, except in median triangles, and perhaps laterally .... 4
2. Large yellow species (17 mm.). Hairs of eyes short, pale, relatively sparse ..... *novaeguineensis* Ric.  
 Small species (12 mm.). Hairs of eyes long, dark brown, dense ..... 3
3. Frons and facial swelling grey in ground colour, with brown tomentum. Palpi with a small bare area (Fig. 2f), and with long yellow hairs below. Parafacials with mostly black hair ..... *auripilosa*, n. sp.  
 Frons and facial swelling reddish in ground colour, with brown tomentum. Palpi with bigger bare area (Fig. 2d), hairs short, black. Parafacials bare, no hairs between antennae and mouth-margin ..... *leonina*, n. sp.
4. Palpi with small bare area (Fig. 2a). Frons and facial swelling grey in ground colour, with greyish tomentum. Abdomen distinctly paler and more translucent at sides, with

- median black spot on second segment and median triangles of yellow hairs. Other abdominal hairs yellow on segmentations, black elsewhere ..... *unilineata*, n. sp.  
Palpi not as figured. Frons and facial swelling usually orange in ground colour .... 5
5. Larger species (15 mm.). Meso- and sternopleura with varying amounts of dark brown or black hair, mixed with some yellow. Wings with pattern indistinct and colour rusty ..... *bernhardi*, n. sp.  
Smaller species (10-13 mm.). Pleura with pale hairs only. Wings usually with pattern clear-cut, and colour dark brown ..... 6
6. Parafacials with conspicuous tuft of yellowish hairs. Mesonotum with some yellow hairs before scutellum, which has black hairs. Abdominal hairs black, pale yellow triangles and yellowish tufts on sides of segments 1, 2 and 6 ..... ? sp.  
No conspicuous pale parafacial tuft ..... 7
7. Wings with basal band and a slight tinting of foreborder, but with no trace of a brown cloud or band across apex of discal cell. Small species with shining yellow-brown abdomen and yellow femora ..... *mafulensis*, n. sp.  
Wings with either a distinct apical band or at least a cloud at apex of discal cell .... 8
8. Palpi broad, leaf-like (Fig. 4). Wings with a distinct cloud at apex of discal cell  
*taylori*, n. sp.  
Palpi longer, blade-like,  $4\frac{1}{2}$  times as long as their greatest breadth. Wings with apical band distinct ..... 9
9. Eyes with pile short, pale, sparse ..... *caliginosa* Walker  
Eyes with pile long, brown, thick ..... 10
10. Abdomen with median triangles of yellow hair. Mesonotum with fine golden hairs just before scutellum, pleural tufts not conspicuous in dorsal view ..... *insularis*, n. sp.  
Abdomen without median triangles of yellow hairs. Mesonotum without golden hairs. White pleural tufts very conspicuous in dorsal view ..... *floccosa*, n. sp.

## SCAPTIA NOVAEGUINEENSIS.

*Erephopsis novaeguineensis* Ricardo, 1913, *Nova Guinea*, ix, zool., 3, p. 404; Schuurmans Stekhoven, 1926, *Treubia*, vi, suppl., p. 64.

This species, of which the paratype is in the British Museum, is very distinct from any other New Guinea species by its large size, yellow appearance, and pale wings. It has been fully described by Ricardo and Schuurmans Stekhoven. Apparently no more specimens have been recorded since the original description.

*Type Locality*: Mt. Hellwig (Lorenz).

## SCAPTIA AURIPILOSA, n. sp.

Lake Habbema, 10,000 ft., viii (Toxopeus). Type ♀ and paratypes 1 ♀, 1 ♂. Type in Buitenzorg Museum, Java.

One of the two species in the present collection in which the abdomen is covered uniformly with short golden hairs. Distinguished by the shape of the palpi (Fig. 2f), which have long yellow hairs, especially ventrally. The frons and face are blackish-grey in ground colour, and cinereous in appearance.

♀. *Head*. Frons and face blackish-grey in ground colour, with brown tomentum. Hairs black, except on parafacials where there are some yellow hairs. Beard white. Eyes with pile long, somewhat sparse, dark brown. Antennae: first two segments brownish, with brownish tomentum, mixed black and yellow hairs, third segment bright orange. Palpi as figured (Fig. 2f). Proboscis  $3\frac{1}{2}$  times as long as palpi.

*Thorax*. Dark brown, with cinereous dusting. Hairs on scutellum and side-margins mostly orange, upright hairs on mesonotum black, recumbent hairs golden. Pleura grey, with white hairs, the propleural and mesopleural tufts partly orange.

*Abdomen*. Tergites uniformly chocolate-brown, with recumbent golden hairs, lateral margins and last three tergites with a few long black hairs. Venter obscurely yellow, with longer golden hairs.

*Legs*. Orange, tarsi and anterior faces of femora somewhat darkened. Long hairs mostly golden on femora, mostly black elsewhere.

*Wings*. Yellowed on foreborder. Basal band faint, apical band absent. Tegulae with black hairs and isolated golden ones. Subepaulets blackish.

*Length*. Body 12 mm.; wing 12 mm.

♂. Similar, except that over the whole body black hairs are longer and more numerous. Abdomen orange at sides basally, recumbent golden hairs tending to bunch into indistinct median triangles.

## SCAPTIA LEONINA, n. sp.

Papua, Mt. Tafa, 8,500 ft., iii, 1934 (Miss Cheesman). Type ♀ and paratypes 1 ♀, 1 ♂.  
Type in British Museum.

Similar to *auripilosa*, of which it might possibly prove to be a light form. The palpi, however, are different (Fig. 2d), parafacial hairs are absent, thorax and abdomen are more translucent in ground colour, and there are no black hairs on the thorax and very few isolated ones on the abdomen after the first segment.

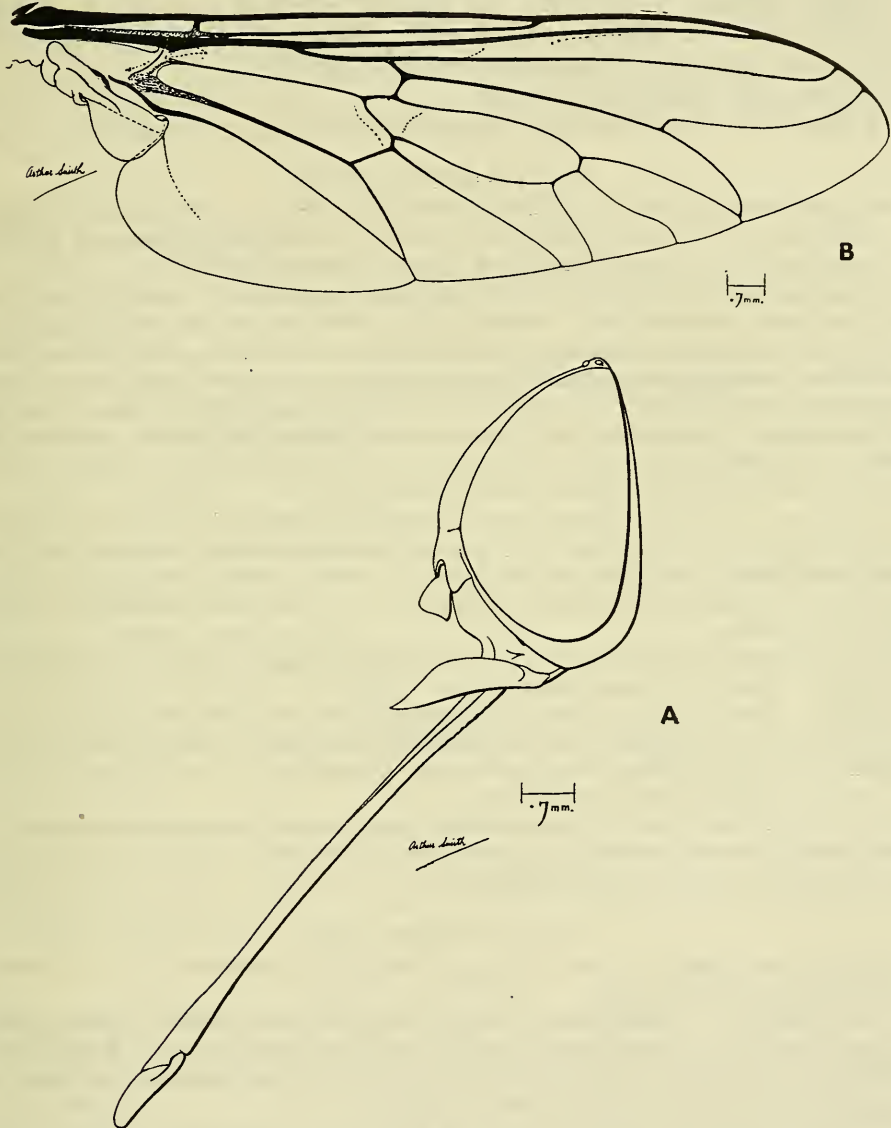


Fig. 3.—*Scaptia novaeguineensis* Ric.: A, head; B, wing. Both from paratype. (Antennae broken.)

♀. *Head.* Frons and face reddish-brown in ground colour, with thick brown tomentum and brown hair. Parafacials bare except for one or two isolated hairs in the lower angle. Beard white. Eyes with pile long, moderately thick, brown. Antennae: first two segments yellow, with yellow tomentum and mixed black and yellow hairs, third segment bright yellow, darker at tip.

*Thorax.* Yellowish-brown, translucent, with faint cinereous dusting. Hairs long and silky, fawn or reddish. Pleura greyish with pale yellow hairs.

*Abdomen.* Translucent yellow, obscurely blackish after second segment. First tergite and part of second with fine black hairs, rest of abdomen with golden or reddish hairs. Venter similar.

*Legs.* Yellow, including tarsi, with predominantly yellow hairs, coxae with long silky yellow hairs.

*Wings.* Yellowed on foreborder, with distinct basal band clouding base of discal cell, and a very small, indistinct spot at apex of discal cell. No distinct apical band. Tegulae with reddish hairs, subepaulets yellow or blackish.

*Length.* Body 11 mm.; wing 11 mm.

♂. Very similar, but with hairy parafacials and somewhat darker abdomen.

SCAPTIA UNILINEATA, n. sp.

Dutch New Guinea, Iwaka R., 7.xi.1910 (Wollaston). Type ♀. Iebele Camp, 7,000 ft., 18.xi.1938, 1 ♀, 1 ♂. Moss Forest Camp, 8,000 ft., 24.x.38, 2 ♀♀ (Toxopeus). Bernhard Camp, 2,000 ft., 20.x.38 (Olthof), 1 ♀. Type in British Museum.

A species distinguished by the blackish frons, palpi with a relatively small bare area, and reddish abdomen with a distinct median black spot on the second segment.

♀. *Head.* Frons black in ground colour, with grey and brown tomentum and black hairs. Face reddish-brown, heavily tomented, hairs mostly black, some yellow. Parafacials with some pale hairs in type, bare in some paratypes. Beard white. Eyes with pile long, brown. Antennae: first two segments brown, with brown tomentum and mostly black hairs, third segment orange, scarcely darkened at tip. Palpi as figured (Fig. 2a). Proboscis 3-3½ times as long as palpi.

*Abdomen.* Translucent orange, with a conspicuous median black area on first and second tergites; later tergites may be obscurely blackish, especially in greasy specimens. Hairs mainly black, with silky yellow hairs in median triangles and on side-margins. Some black hairs in lateral tufts on segments 3-5. Venter orange, obscurely blackish, hairs mainly yellow.

*Legs.* Femora blackish, tibiae and tarsi orange, darkened at tips, hairs mixed black and yellow. Coxae with mainly black hairs.

*Wings.* Basal band distinct, apical band fainter, and the brown colour more pronounced along the veins. Apex of discal cell and base of radial fork distinctly clouded. Tegulae with black hairs, subepaulets blackish.

*Length.* Body 11 mm.; wing 12 mm.

♂. Similar, except that black hairs are longer and more numerous, especially on venter, and a few are present on mesopleuron. First two antennal segments black, contrasting sharply with orange flagellum.

SCAPTIA BERNHARDI, n. sp.

Bernhard Camp, 2,500 ft., x.1938 (Olthof). Type ♀ and paratypes 1 ♀, 1 ♂. Type in Buitenzorg Museum, Java.

This species is distinguished from the other New Guinea species, except *novaeguineensis*, by its larger size and by the shape of the head, which in dorsal view is distinctly triangular, not smoothly rounded as in the other species. The wings are strongly yellowed all over, with a rusty appearance.

♀. *Head.* Frons and face reddish in ground colour, with brown tomentum, hairs dark brown or black, a few paler. Hairs of parafacials black. Eyes with pile short, rather light brown, moderately thick. Beard yellow or brownish. Antennae: first two segments reddish, with reddish tomentum and black hairs, third segment orange with darker tip. Palpi as figured (Fig. 2h). Proboscis four times as long as palpi.

*Thorax.* A dark reddish-brown, paler above wings and on hind margin of scutellum, pleura dark reddish-brown. Hairs on dorsum black, those on lateral callosities and on pleura mixed black and yellow. Black predominate in one female, yellow in the other,



but the presutural tuft, and those on mesopleuron, sternopleuron and coxae are mainly black in both specimens.

*Abdomen.* Tergites reddish-brown, with black hairs, no trace of median triangles. Venter similar, but with a few short yellow hairs on hind margin of some segments. Lateral tufts black.

*Legs.* Blackish-brown, with black hairs and bristles.

*Wings.* Distal band absent, proximal band faded to a yellow-brown. The whole wing, except for the middles of the discal and basal cells, is yellowed, giving it a rusty appearance to the naked eye. Tegulae with black hairs, subepaulets blackish.

*Length.* Body 15 mm.; wing 16 mm.

♂. Resembles the female except in the following details: eyes more rounded in dorsal view, with thick brown pile; frons blackish with silvery tomentum; face a darker brown in ground colour; abdominal hairs longer and more erect, all black.

SCAPTIA MAFULENSIS, n. sp.

Papua, Mt. Mafulu, 4,000 ft., xii.33 and i.34 (Miss Cheesman). Type ♀ and 3 paratype ♀♀. Type in British Museum.

Distinguished from the *caliginosa* group of species by the sparser, paler pubescence of the eyes and the entire absence of the distal band of the wing. It is paler in general ground colour than those species.

♀. *Head.* Frons and face reddish-yellow in ground colour, with yellowish tomentum, especially at sides, hairs black with some yellow, especially on face and antennary segment (sub-callus). Hairs of parafacials mainly black. Beard whitish. Eyes with pile somewhat paler and sparser than in *caliginosa* group. Antennae: first two segments reddish-yellow, with yellow tomentum and hairs mainly black, one or two ventral ones yellow; third segment bright orange, slightly darkened at tip. Palpi as figured (Fig. 2b). Proboscis  $3\frac{1}{2}$  times as long as palpi.

*Thorax.* Reddish-brown with a thin, uniform tomentum. Dorsum with black hairs, a few paler ones on margins. Presutural tuft black, supra-alar black above, yellowish below, postalar mainly black. Pleura yellow or reddish-yellow in ground colour, with entirely white hairs.

*Abdomen.* Tergites shining translucent yellow, with black clothing hairs. Some trace of small yellow median triangles. Lateral margins with isolated pale hairs, but no distinct tufts. Venter similar, with yellowish hairs.

*Legs.* Pale yellow. Coxae with pale hairs above, some black hairs below. Femora dorsally with pale hairs, tibiae and tarsi ventrally with red bristles; otherwise hairs and bristles black.

*Wings.* Usual pattern much reduced. Yellow foreborder and basal brown band still present, but apical band entirely absent, leaving only a faint general tinting of the whole apex of the wing. Tegulae with black hairs anteriorly, golden hairs posteriorly, subepaulets pale, bare.

*Length.* Body 10 mm.; wing 11 mm.

SCAPTIA TAYLORI, n. sp.

N. New Guinea, Edie Creek, 6,550-7,000 ft. (Taylor). Type ♀ and 11 paratype ♀♀. Type in School of Public Health and Tropical Medicine, Sydney.

Smaller than the *caliginosa* group, the distal dark band of the wing less distinct, palpi broader.

♀. *Head.* Frons and face obscurely orange in ground colour, with thick brown tomentum and black hairs. Hairs of parafacials mingled black and yellowish. Beard yellowish-white. Eyes with pile long, thick and brown, somewhat paler ventrally. Antennae: first two segments reddish-yellow, with tomentum and black hairs, third segment reddish, slightly darkened towards tip. Palpi as figured (Fig. 4). Proboscis not more than 3 times as long as palpi.

*Thorax.* Reddish-brown, with grey tomentum and traces of a narrow central dark stripe, scutellum similar. Dorsum clothed with long, very fine black hairs, among

which are a few isolated yellowish hairs, but these are not obvious. Presutural tuft black, with some yellowish hairs; supra-alar and post-alar mainly whitish with some black hairs. Pleural tufts all yellowish-white.

*Abdomen.* Tergites shining reddish-brown with irregular black patches, especially towards tip, segmentations translucent yellowish. Clothing hairs black, with very small

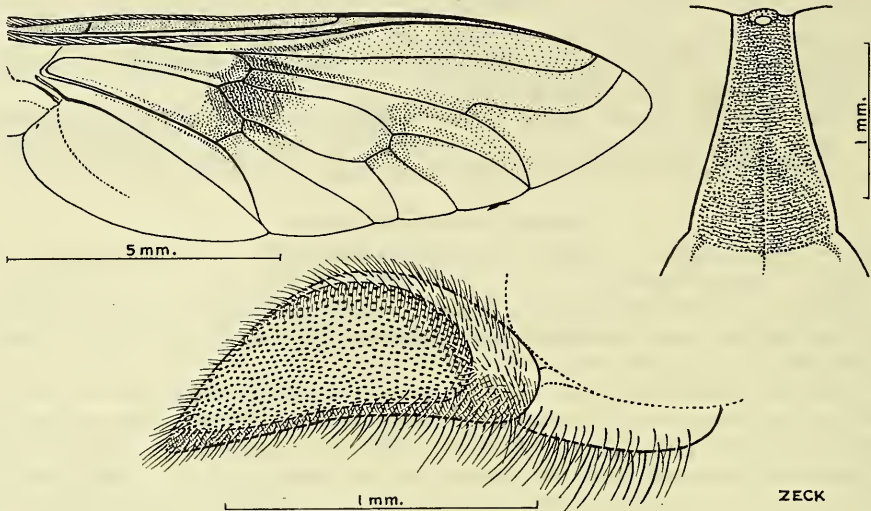


Fig. 4.—*Scaptia taylori*, n. sp.: wing, frons and palp.

median triangles of yellow hairs. Lateral margins without any thick tufts, but with a fringe of yellowish hairs. Venter similar in ground colour, with recumbent yellow hairs, black on sixth and seventh sternites.

*Legs.* Yellow or reddish-yellow. Coxae tomentod, with mixed yellowish and black hairs. Femora with yellowish hairs above, otherwise hairs and bristles mostly black, long ventral bristles red.

*Wings.* Usual pattern somewhat reduced, so that the apical band is represented by a small, not very distinct, cloud at apex of distal cell (Fig. 4). Tegulae with black hairs anteriorly, golden hairs posteriorly; subepaulets bare, yellow, with golden sheen.

*Length.* Body 12 mm.; wing 13 mm.

#### SCAPTIA CALIGINOSA.

*Scaptia caliginosa* Walker, 1865, *J. Proc. Linn. Soc. Lond.*, 8, p. 108.

*Diatomineura caliginosa* Ricardo, 1900, *Ann. Mag. Nat. Hist.*, (7) 5, p. 118; 1913, *Nova Guinea*, ix, zool., 3, p. 403.

*Erephopsis caliginosa* Schuurmans Stekhoven, 1926, *Treubia*, vi, suppl., p. 62.

Schuurmans Stekhoven makes the odd mistake of quoting as type of this species a female collected by Wollaston in the Upper Utaqua Valley in March, 1912—forty-seven years after the original description! He states that he saw two females of this species in the British Museum, both collected by Wollaston. It seems that he did not see the real type specimen, which bears a label in Walker's handwriting "caliginosa n", and labels of later date reading "New Guinea" and "*Pangonia caliginosa* Walker, type". Neither Wollaston specimen appears to me to be conspecific with it. One I have made the type of my species *unilineata*; the other, which Schuurmans Stekhoven regarded as the type of *caliginosa*, has a conspicuous tuft of white hairs on the parafacials and is difficult to relate to any other specimens. It belongs near *caliginosa*, and may represent a variant of that species, but the specimen is in poor condition and I have to leave it undetermined. I do not understand why Schuurmans Stekhoven says the

first posterior cell is closed on the wing margin. This is not so in any of the three specimens referred to above.

The following description, taken from the specimen bearing Walker's label, differs from his description in two respects; the palpi are reddish, not black (pointed out by Ricardo, 1900), and there is no appendix to  $R_4$ . There is, however, a well-marked shadow which could easily be mistaken for a short appendix, and as Walker is known to have worked with very primitive optical equipment, I think this discrepancy should be disregarded.

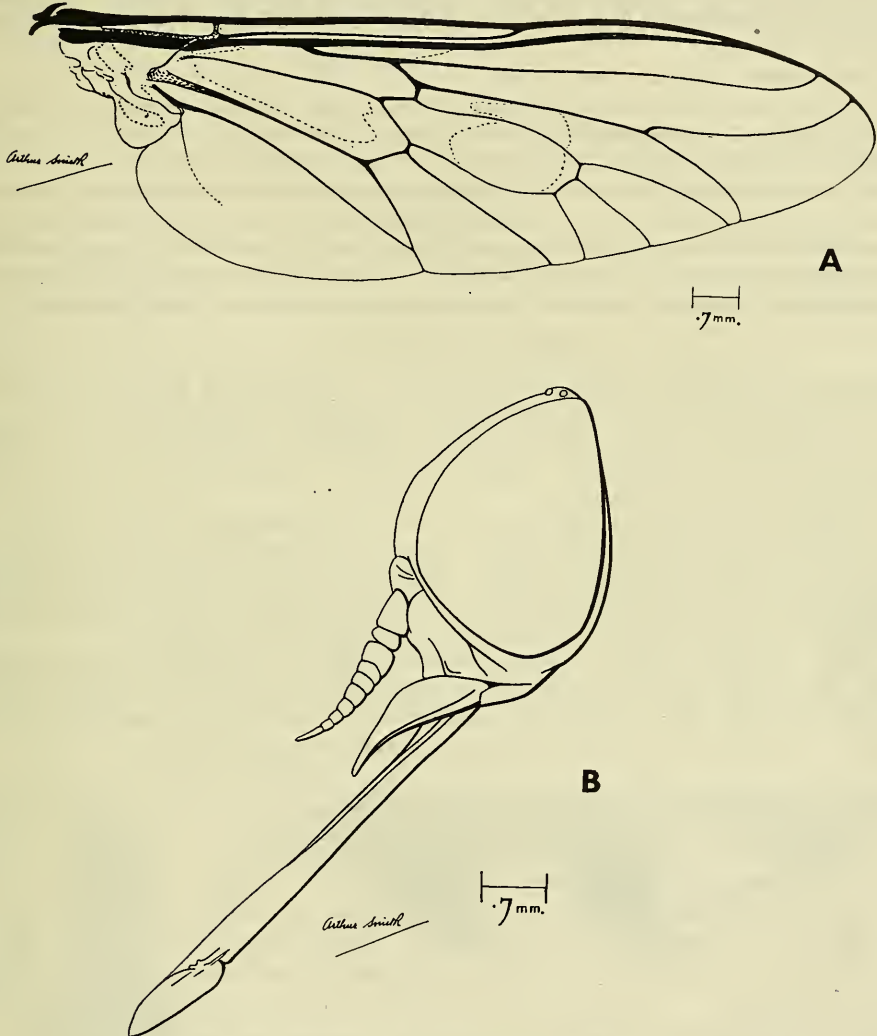


Fig. 5.—*Scaptia caliginosa* Walk.: A, wing; B, head. Both from type.

♀. *Head*. Frons very dark red in ground colour, with brown tomentum and black hairs. Subcallus and face more yellow-brown, latter with mostly black hairs. Parafacial hairs sparse, some pale. Beard snowy white. Eyes with pile sparse, pale and very short, except ventrally. I am not sure how far this can be attributed to the age of the specimen and to rubbing. Antennae: first two segments orange, with yellow tomentum and black hairs, flagellum bright orange, not darkened at tip. Palpi as figured (Fig. 2e), hairs short and black. Proboscis not more than three times length of palpi.

*Thorax.* Shining reddish-brown with grey tomentum and black hairs, except for a few pale ones in supra-alar and post-alar tufts. Presutural tuft black. Pleura orange, with grey tomentum and white hairs.

*Abdomen.* Denuded. Tergites shining mahogany-red, with black hairs and small median triangles of yellow hairs. Lateral tufts white. Venter similar, with mainly pale hairs.

*Legs.* Dark reddish-brown, obscurely blackish in parts, especially on anterior faces. Hairs, including those of coxae, mainly black.

*Wings.* With both basal and apical bands dark and well defined.  $R_4$  without appendix. Tegulae with black hairs, subepaulets dark reddish. (Fig. 5 indicates only outlines of bands.)

*Length.* Body 13 mm.; wing 13 mm.

In the present collection the following series, though differing in some details from the type, appear to be conspecific. Bernhard Camp, 1,800–2,500 ft., 5.xi.38, 3 ♀♀; 2,100 ft., 10.xi.38, 1 ♀; 4,200 ft., 23.x.38, 2 ♀♀ (Oithof). Type in British Museum.

It is possible that the two following species are merely geographical forms of *caliginosa*. As represented in the present collection they are distinct units, but each series was collected in one area, *floccosa* in Papua, *insularis* in Japen I., and *caliginosa* in the central mountains of Dutch New Guinea. Until representatives from intermediate localities can be studied it is better to describe each form as a distinct species.

SCAPTIA FLOCCOSA, n. sp.

Papua, Mt. Tafa, 8,500 ft., ii.1934 (Miss Cheesman). Type ♀ and 3 paratype ♀♀; Kaindu, Edie Creek, 6,550–7,000 ft. (Taylor), 1 ♀. Type in British Museum.

A squarely-built species, abdomen rounded posteriorly, shining brown, with black hairs. Thorax with conspicuous white hairs laterally, eyes with dense, long brown pile, wings strongly marked.

♀. *Head.* Frons and face obscurely orange, with thick brown tomentum and black hairs. Parafacials with long black hair. Beard snowy white. Eyes with pile thick, long, dark brown. Antennae: first two segments yellow with black hairs, flagellum reddish, last three annuli blackish. Palpi as figured (Figs. 2g and 6), terminal point unusually long and narrow. Proboscis about  $3\frac{1}{2}$  times as long as palpi.

*Thorax.* Shining reddish brown, mesonotum with two indistinctly tomented grey stripes and clothed with sparse, fine, black hairs. Presutural tuft black, supra-alar and post-alar tufts very white, conspicuous in dorsal view. Pleura grey-tomented, hair-tufts pure white except for a few intermingled black hairs on the mesopleuron.

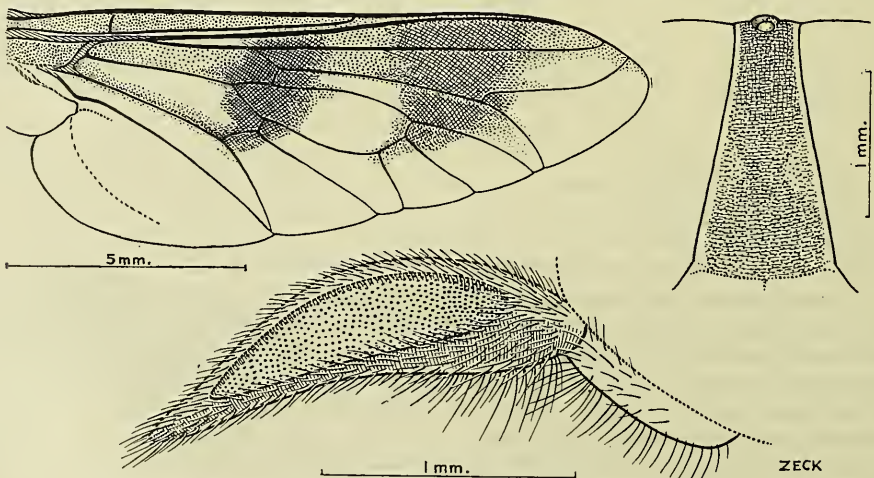


Fig. 6.—*Scaptia floccosa*, n. sp.: wing, frons and palp.

*Abdomen.* Shining reddish-brown, first segment mainly black, with a median extension of black colour on to second tergite, clothed with recumbent black hairs, without any pale median spots or triangles. Lateral tufts black except on segments 1, 2 and 6, where they are mainly white. Venter similar, somewhat darker towards tip, with black hairs, and with some white hairs on segments 1 and 2 and on the segmentations.

*Legs.* Yellow, slightly darker towards tarsi, with long black hairs. Coxae grey-tomented, with black or dark brown hairs.

*Wings.* With well-defined brown pattern (Fig. 6), tegulae with white tuft, subepaulets blackish.

*Length.* Body 13 mm.; wing 13 mm.

SCAPTIA INSULARIS, n. sp.

Japen I., Camp 2, Mt. Eiori, 2,000 ft., x.38. Paratypes 3 ♀♀; Japen I., Camp 1, Mt. Baduri, 1,000 ft., ix.38. Type ♀ and paratypes 5 ♀♀, 1 ♂; Papua, Mt. Tafa, 8,500 ft., ii.1934, 1 ♀ (Miss Cheesman). Type in British Museum.

Very similar to *floccosa*, from which it differs in having fine golden hairs on the mesonotum, especially just before the scutellum, and on the scutellar margin, and black hairs ventrally on the sternopleuron. White pleural tufts less conspicuous in dorsal view, black lateral tufts on segments 3, 4 and 5 of the abdomen weaker and less conspicuous, median triangles of yellowish hair can be traced on abdomen.

♀. *Head.* Frons and face obscurely orange in ground colour, with thick brown tomentum and black hairs. Parafacials with long, rather sparse black hair. Beard white. Eyes with pile thick, as long as first antennal segment, brown. Antennae: first two segments yellowish-brown with black hairs, flagellum reddish, not markedly darkened towards tip. Palpi as figured (Fig. 2c). Proboscis  $3\frac{1}{2}$  times as long as palpi.

*Thorax.* Reddish-brown, more heavily tomented than in *floccosa*, with traces of a dark median stripe anteriorly. Scutellum orange. Dorsum clothed with fine black hairs and intermingled, sparse, fine golden hairs, which are especially noticeable on the fore and hind margins of the scutellum. Presutural tuft black, with some yellowish hairs; supra-alar half black, half yellowish-white; post-alar white with a few fine golden hairs. These tufts are not conspicuous in dorsal view. Pleura reddish in ground colour, with grey tomentum, hairs white or yellowish, some black ventrally on sternopleuron.

*Abdomen.* Shining reddish-brown, first segment not markedly black, later segments blackish basally. Clothing hairs black; a small triangle of yellow hairs can be detected on all visible tergites. Lateral tufts less bushy than in *floccosa*, and mainly yellowish. Venter similar in ground colour, with rather sparse black hairs.

*Legs.* Yellow, slightly darker towards tarsi, with mixed black and yellow hairs. Coxae grey-tomented, white hairs dorsally, black hairs ventrally.

*Wings.* With well-defined pattern, both bands present. Tegulae with whitish tuft; subepaulets bare, clear yellow, in marked contrast to black bristles of base of costa.

*Length.* Body 12 mm.; wing 14 mm.

♂. Agrees with the female except in the following details: pale pubescence distinctly yellow; parafacials with yellow tuft; mesonotum with yellow hairs on anterior border, otherwise with only isolated golden hairs to be detected among black hairs of mesonotum and scutellum; abdominal tergites 3-6, blackish, with translucent yellow hind-margins. Black hairs more erect than in female, and median yellow triangles more conspicuous.

The female from Papua, Mt. Tafa, is provisionally assigned to this species. It differs from the Japen specimens in having blackish subepaulets, some pale hairs on the parafacials, and slightly differently shaped palpi. In some respects it is transitional between *insularis* and *floccosa*.

## Genus SILVIUS.

*Silvius* Meigen, 1820, *Syst. Besch.*, II, p. 27. Genotype: *Tabanus vituli* Fabr., monotypic.

The following species of Pangoniinae from New Guinea have been recorded in the genus *Silvius*: \**dimidiatus* Wulp, 1868; \**dimidiatus* subsp. *femoralis* Ricardo, 1913; \**de meijerei*, \**vittatus* Ricardo, 1913; *latistriatus*, *atriventer*, *atripes*, *variegatus*, ? *atratus* Schuurmans Stekhoven, 1926, and *flavicinctus* S. Stekhoven, 1932.

I have seen specimens of those species marked with an asterisk, none of which is a true *Silvius*. The genotype, a Palaearctic species, has a very broad, almost square frons, with a large, circular, shining callus, and the first antennal segment is more than twice as long as the second (Fig. 7). All the New Guinea species have a narrow, elongate

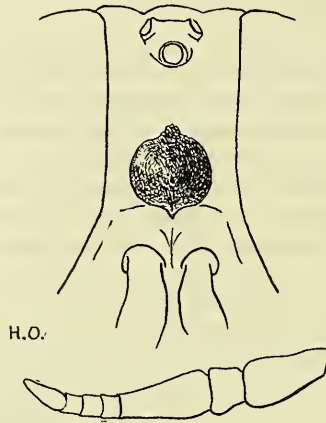


Fig. 7.—Frons and antenna of *Silvius vituli* Fabr., genotype of *Silvius*.

frons with a club-shaped callus which has a median extension reaching almost to the ocelli, and the first antennal segment is not much longer than the second (Fig. 8). All the specimens I have seen have the frons narrowest at the antennae, broadening towards the ocelli.

As long ago as 1880, Osten Sacken (*Ann. Mus. Civ. Genova*, 16, p. 419) stated that *Silvius dimidiatus* Wulp "is not a true *Silvius* because the antennae have a different shape and the eyes show trace of a broad crossband, while the known species of *Silvius* have greenish eyes, dotted with black". His specimen belonged to *femoralis* Ric., but that does not affect his argument. Ricardo (1913, p. 405) says the eyes of *vittatus* "appear to have one or more greenish crossbands, as in *S. dimidiatus*". I have not seen any clear trace of a crossband in any of my specimens, but Wulp mentions it and indicates it in his figure.

It seems clear, therefore, that the first four species on the list must be placed in a genus other than *Silvius*. I have not seen any of Schuurmans Stekhoven's species, but from the descriptions, *atriventer* and *flavicincta* seem to agree with this group in the structure of the frons. The others have no ocelli, and the frons, though elongate, is of variable shape.

Enderlein (1922, p. 344) erects a new genus *Pareucompsa* for *S. dimidiatus* Wulp because it has only four segments in the flagellum of the antennae (i.e., a total of six antennal segments)—one fewer than in true *Silvius*. This applies to *femoralis* also, but not to the other New Guinea species. Wulp and Schuurmans Stekhoven each figure five flagellar segments in *dimidiatus*, but they are wrong. Every specimen I have seen has only four, and an antenna cleared and mounted in balsam shows that there are four clearly-defined segments.

Since *dimidiatus* and *femoralis* have such a distinct facies, with *Chrysops*-like wings (Fig. 9), and thorax and abdomen strongly patterned, it is convenient to divide them off from the rest in this way. *Pseudopangonia* Ricardo, which also has four

flagellar segments, is a large, yellow, *Coenomyia*-like form; moreover, the flagellum is of altogether different construction, awl-like, with a broad basal segment and three longer, cylindrical ones. *Silviochrysops* Szilady, from Formosa, is rather inadequately described. The *Chrysops*-like wing-pattern seems to resemble that of *dimidiatus*, but the frons is described as squarish and the callus oval. There is no mention of the number of flagellar segments.

The two other New Guinea species I have seen—*de meijerei* Ric. and *vittatus* Ric.—although apparently closely related to *Pareucompsa* by the structure of frons and first antennal segment, yet can clearly be divided off by their five-segmented flagellum and their general appearance, with clear wings and a dull body-colour. They agree, in fact, with those Australian species hitherto included in the genus *Silvius*. As pointed out by Ferguson (1926, p. 301), these species fall into several groups, but as I have not made a close study of them I am not prepared to suggest any further subdivision. It is clear, however, that they do not belong to *Silvius*, and that some other name must be found for them.

The name *Lilaea* Walker is available and will be discussed below.

#### Genus PAREUCOMPSA.

*Pareucompsa* Enderlein, 1922, *Mitt. zool. Mus. Berl.*, 10 (2), p. 344; 1925, *Ibid.*, 11 (2), p. 320. Genotype: *Silvius dimidiatus* Wulp, by original designation.

Distinguished from *Silvius* Meigen by the elongate frons and frontal callus, the shorter first antennal segment (Fig. 8A), and the reduction of the flagellar segments of the antenna to four. The two known species are distinctive in appearance, with a *Chrysops*-like wing-pattern, and thorax and abdomen divided into a light anterior half and a dark posterior half.

#### KEY TO SPECIES.

Femora blackish, concolorous with tibiae and tarsi. Second abdominal segment with a clear-cut transverse dark brown band, following segments more or less distinctly banded  
*dimidiata* Wulp  
 Femora orange, contrasting with tibiae and tarsi, which are darker. Second abdominal segment without a transverse band, following segments obscurely darkened, but not distinctly banded ..... *femoralis* Ric.

#### PAREUCOMPSA DIMIDIATA.

*Silvius dimidiatus* Wulp, 1868, *Tijdschr. v. Ent.*, xi, p. 6; Ricardo, 1901, *Ann. Mag. nat. Hist.*, (7) viii, p. 296; 1913, *Nova Guinea*, ix, zool., 3, p. 404; Schuurmans Stekhoven, 1926, *Treubia*, vi, suppl., p. 56.

This very distinct species is figured in colour by van der Wulp, and is easily separated from the following species by the characters given in the key. In both species the mesonotum is yellow-green before the suture and chocolate-brown behind it.

*Length.* Body 12 mm.; wing 10 mm.

Wulp described this species originally from Salawati I., and Ricardo records it from Regen I., Bivak I. (one of Lorenz's localities, presumably in the same general area), and Digul. In the present collection is a series of 29 females, all from Bernhard Camp, 150 ft., 4.viii-15.x.38 (Olthof)—i.e., in the river valley, close to the oxbow lake on which this camp was founded (Archbold *et al.*, 1942, p. 231). Two of Ricardo's specimens are in the British Museum, and there is one from Bigot's collection labelled simply "New Guinea". Type in Rijks Museum of Natural History, Leyden.

#### PAREUCOMPSA FEMORALIS.

*Silvius dimidiatus* Osten-Sacken, 1880, *Ann. Mus. Civ. Genova*, xvi, p. 478, *nec* Wulp.  
*Silvius dimidiatus* subsp. *femoralis* Ricardo, 1913, *Nova Guinea*, ix, zool., 3, p. 405; Schuurmans Stekhoven, 1926, *Treubia*, vi, suppl., p. 57.

This species is distinguished from *dimidiatus* by the characters given in the key above. On the average it is slightly smaller.

*Length.* Body 11 mm.; wing 10 mm.

Ricardo described this as a subspecies of *dimidiatus*, presumably doubting whether the colour differences existing were sufficiently great to justify erecting a new species. These differences are very constant in all the specimens I have seen. The two cannot be geographical races, since they occur together. Doré I., Osten-Sacken's locality, is quite near Salawati I., the type-locality of *dimidiatus*; both forms occur on Regen I.; and the Archbold Expedition took both together at Bernhard Camp. It is possible that this may be a dimorphic species, with two genetically distinct forms occurring roughly in the proportion of three to one, but there is no direct evidence for this. Until the two forms can be studied in the field it is better to regard them as distinct species.

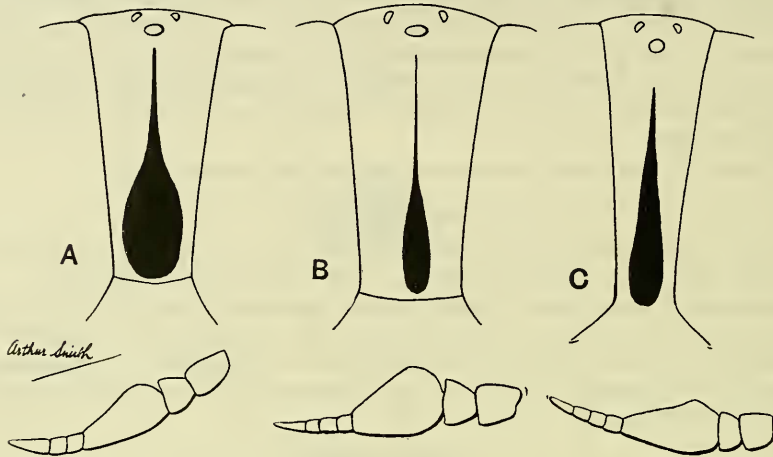


Fig. 8.—Frons and antenna of: A, *Pareucompsa dimidiata* Wulp; B, *Lilaea vittata* Ric.; C, *L. de meijerei* Ric.

Described from Regen I., Osten-Sacken's specimen, recorded as *dimidiatus*, was from Doré I. In the present collection 10 ♀♀ from Bernhard Camp, 150 ft., 4.viii-15.x.38 (Olthof): 1 ♀ Wewak (C. M. Deland). One of Ricardo's paratypes is in the British Museum. Type in Rijks Museum of Natural History, Leyden.

#### Genus LILAEA.

*Lilaea* Walker, 1850, *Ins. Saunds Dipt.*, I, p. 11; Surcouf, 1921, in Wytsman, *Genera Insect.*, 175, p. 561; Ferguson, 1924, *Bull. ent. Res.*, xiv, p. 254; 1926, *Ibid.*, xvi, pp. 294, 302, 304. Genotype: *Pangonia lurida* Walker, by designation of Coquillett, 1910.

Distinguished from *Silvius* Meig. by the elongate frons and frontal callus, and the shorter first antennal segment (Figs. 8B, C), and from *Pareucompsa* End. by having five flagellar segments (total antennal segments seven). The New Guinea species are clear-winged, yellow to blackish-brown in colour, sometimes with abdominal markings like those of *Tabanus*.

There has been much confusion about this genus. Walker included two species, *roei* King and *lurida* Walk., and stated in his generic description: "stump of the tip cross-vein about twice the length of the shorter side of the angle from which it springs". Coquillett (1910) selected *lurida* as genotype. Enderlein (1922, p. 341; 1925, p. 297) erroneously selected *roei* as type, thus making the genus a synonym of *Scaptia*. According to his description and key, *Lilaea* had no appendix to  $R_4$ . Ferguson (1924, 1926) was puzzled by the discrepancy between Enderlein's description and Walker's, but omitted to notice that specimens of *lurida* identified by himself (now in the British Museum) also had no appendix to  $R_4$ . He sank *Lilaea* as a synonym of *Silvius*.

In the British Museum are the type specimen of *lurida* (Port Stephen, New Holland) and the second specimen from Swan River (Richardson). These are conspecific with modern specimens determined by Ferguson, and none of them has an



appendix to R. We therefore have the odd position of a genotype correctly selected from among the included species, and correctly identified from its type specimen, but which does not agree with the original generic description.

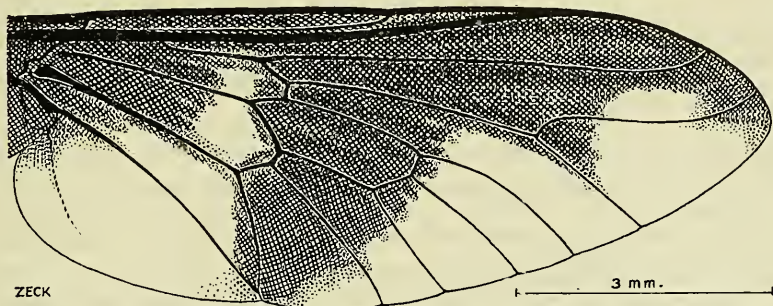


Fig. 9.—*Pareucompsa dimidiata* Wulp: wing.

In this instance, when the identity of the species is not in doubt, and we need a new name for the genus, I think we may disregard Walker's statement and resurrect the genus *Lilaea*. So far as I can see, it will include most of the Australian species hitherto placed in *Silvius*. I have not seen a true *Silvius* from Australia.

Ricardo (1900, *Ann. Mag. nat. Hist.*, (7) v, p. 121) says: "The *Pangonia lurida*, ♀, Walker is not a *Pangonia* at all; it belongs to the Tabaninae." This statement has contributed to the confusion about this species, and so far as I can see, it is without foundation. The type of *lurida* has lost both its hind legs, but the paratype has distinct spurs, and both specimens have ocelli.

#### LILAEA DE MEIJEREI.

*Silvius de meijerei* Ricardo, 1913, *Nova Guinea*, ix, zool., 3, p. 405.

*Silvius de Meyeri* Schuurmans Stekhoven, 1926, *Treubia*, vi, suppl., p. 52.

A small species, of rather nondescript appearance. Thorax grey-brown, with a greenish tinge in certain lights. Abdomen yellow-brown basally, black-brown apically, with yellow segmentations, each fringed with yellow hairs. Frons broadened towards vertex, with elongate, club-shaped callus almost reaching ocelli.

*Length.* Body 10 mm.; wing 9 mm.

Distinguished from *vittatus* Ric. by the absence of the broad median stripe on the abdomen, and from the species described by Schuurmans Stekhoven by the shape of the frons.

Described from Rivierkamp (Lorenz) and the Digul River. In the present collection: Bernhard Camp, 150 ft., 7.viii.38–15.x.38 (Olthof), 23 ♀♀; Bernhard Camp, 300 ft., 10.iv.39 (Toxopeus), 2 ♀♀; Angoram (no date) (S. H. Christian), 6 ♀♀; N. New Guinea Exped., 1926, Motorbivak, vi (v. Leeuwen), 4 ♀♀. Type in Rijks Museum of Natural History, Leyden.

The two females taken in April by Dr. Toxopeus at a slightly greater altitude than the others can be correlated with the interesting account in Archbold *et al.* (1942, pp. 233 et seq.) of the wet season flooding of the Meervlakte and the change in conditions around Bernhard Camp.

#### LILAEA VITTATA.

*Silvius vittatus* Ricardo, 1913, *Nova Guinea*, ix, zool., 3, p. 405; Schuurmans Stekhoven, 1926, *Treubia*, vi, suppl., p. 49.

A clear-winged species, distinguished by the pale median stripe of the abdomen formed by a broad equilateral triangle on each segment, occupying about one-third of the width of the abdomen.

*Length.* Body 11 mm.; wing 10 mm.

Known to me only from the two paratypes collected by Lorenz and deposited in the British Museum, this species is not represented in the present collection. Type in Rijks Museum of Natural History, Leyden.

## REFERENCES.

- ARCHBOLD, R., RAND, A. L., and BRASS, L. J., 1942.—Summary of the 1938-39 New Guinea Expedition. *Bull. Amer. Mus. Nat. Hist.*, 79: 197-288.
- BEQUAERT, J., 1930.—Entomology: Tabanidae, in STRONG, *Rep. Harvard-African Exped. African Repts. Liberia, Belgian Congo*: 858-971.
- CHEESMAN, L. E., 1935.—The Two Roads of Papua. Jarrolds, London.
- , 1938.—The Cyclops Mountains of Dutch New Guinea. *Geogr. J. Lond.*, (5) 91 (1): 21-30.
- , 1940.—Two Unexplored Islands of Dutch New Guinea (Waigau, Japen). *Ibid.*, (5) 95 (3): 208-217.
- COQUILLET, D. W., 1910.—The Type-Species of the North American Genera of Diptera. *Proc. U.S. Nat. Mus.*, 37: 499-647.
- ENDERLEIN, G., 1922.—Ein neues Tabanidensystem. *Mitt. zool. Mus. Berl.*, 10 (2): 333-351.
- , 1925.—Studien über blutsaugenden Insekten. 1. Grundlagen eines neues System der Tabaniden. *Ibid.*, 11 (2): 255-409.
- FERGUSON, E. W., 1924.—Notes on the Nomenclature of Australian Tabanidae, subfamily Pangoniinae. *Bull. ent. Res.*, 14: 251-263.
- , 1926.—Additional Notes on the Nomenclature of Australian Tabanidae. *Ibid.*, 16: 293-306.
- FULLER, M., 1936.—Biology of *Scaptia awriflua* Don. *PROC. LINN. SOC. N.S.W.*, 61: 1-9.
- HILL, G. F., 1921.—The Bionomics of *Tabanus aprepes* and other Australian Tabanidae. *Bull. ent. Res.*, 12: 41-62.
- RICARDO, G., 1913.—Tabanidae of New Guinea. *Nova Guinea*, ix, Zool., 3: 387-406.
- SCHUURMANS STEKHOVEN, J. H., jnr., 1926.—The Tabanids of the Dutch East Indian Archipelago. *Treubia*, vi, Suppl.: 1-551.
- , 1932.—Résultats scientifiques du Voyage aux Indes Orientales Néerlandaises . . . Tabanidae. *Mem. Mus. Hist. nat. Belg.*, 4 (7): 11-16.
- TAYLOR, F. H., 1946.—The Diptera of the Territory of New Guinea. xiii. Family Tabanidae. Part i. The Genus *Chrysops*. *PROC. LINN. SOC. N.S.W.*, 70 (for 1945): 328-332.
- TOXOPEUS, L. J., 1939.—Entomologische Notities uit Nieuw-guinea. *Ent. Meded. Ned.-Ind. Buitenzorg.*, 5: 11-17; 24-37; 59-71 et seq.
- WALKER, F., 1850.—*Insecta Saundersiana*, Diptera I.